

detecting at least one variation in intensity in the adjusted intensity profile downstream of the first position; and

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determining a direction or parallelism of the beam while implanting into said work piece relative to a reference direction in response to detecting a distance in at least one dimension between a position where the at least one variation in intensity is detected and the first position where the adjusted intensity profile is formed.

C²
11. (As Amended) A method for determining a direction or parallelism of an ion beam, comprising:

forming an ion beam which is implanted into a work piece;
blocking a portion of the beam with a beam modifier;
identifying a position where a shadow is formed separate from and downstream of the beam modifier; and
determining a direction or parallelism of the ion beam while implanting into said work piece in response to detecting a distance between the position of the shadow and the position of the beam modifier.

C³
14. (As Amended) An apparatus for determining a direction or parallelism of a beam, comprising:

means for forming a beam which is implanted into a work piece;
means for forming an adjusted intensity profile from at least a portion of the beam at a first position;
means for detecting an intensity profile of at least a portion of the beam downstream of the first position at a second position that is variable in distance from the first position in accordance with changes in direction or parallelism of the beam relative to a reference direction; and
means for determining a direction or parallelism of the beam relative to a reference direction while implanting into said work piece in response to detecting a distance between a position of the detected intensity profile and a position where the adjusted intensity profile is formed.

15. (As Amended) An apparatus for determining a direction or parallelism of a charged particle beam, comprising:

at least one detector that detects an intensity profile of at least a portion of the charge particle beam which is implanted into a work piece;

C3 a beam modifier that alters an intensity profile of at least a portion of the charged particle beam upstream of the at least one detector; and

a controller that determines a direction or parallelism of the charge particle beam relative to a reference direction while implanting into said work piece in response to a detected distance in at least one dimension between a position where the intensity profile is detected by the at least one detector and a position where the beam modifier created the detected intensity profile.

21. (As Amended) A ion beam implantation apparatus comprising:

C4 a charged particle beam generator that generates a charged particle beams;

at least one detector that detects an intensity profile of at least a portion of the charge particle beam which is implanted into a work piece;

a beam modifier that alters an intensity profile of at least a portion of the charged particle beam upstream of the at least one detector; and

a controller that determines a direction or parallelism of the charge particle beam relative to a reference direction while implanting into said work piece in response to a detected distance in at least one dimension between a position where the intensity profile is detected by the at least one detector and a position where the beam modifier created the detected intensity profile.

C5 23. (As Amended) An apparatus for determining a direction or parallelism of a charged particle beam, comprising:

at least one detector that detects an intensity profile of at least a portion of the charge particle beam which is implanted into a work piece;

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a beam modifier that alters an intensity profile of at least a portion of the charged particle beam upstream of the at least one detector; and

a controller that determines a direction or parallelism of the charge particle beam relative to a reference direction while implanting into said work piece in response to a detected distance in at least one dimension between a position where the intensity profile is detected by the at least one detector and a position where the beam modifier created the detected intensity profile;

wherein the at least one detector includes at least three detectors and the controller determines a direction or parallelism of the charged particle beam in three dimensions relative to the reference direction.

C6
25. (As Amended) A method for determining a direction or parallelism of a beam, comprising:

forming a beam which is implanted into a work piece;

at a first beamline location, modifying the beam to produce a modified intensity profile having a spatial intensity variation;

at a second beamline location downstream of the first beamline location, detecting the spatial intensity variation in the modified intensity profile; and

determining a beam direction or parallelism while implanting into said work piece based on relative positions of the spatial intensity variation in the modified intensity profile at the first and second beamline locations.
